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TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/692,116
Filing Date	10/23/2003
First Named Inventor	Ronald Caudill
Art Unit	3727
Examiner Name	Stephen J. Castellano
Attorney Docket Number	282660-00247

Total Number of Pages in This Submission

ENCLOSURES *(Check all that apply)*

- [✓] Fee Transmittal Form
- [ ] Fee Attached
- [ ] Amendment/Reply
- [ ] After Final
- [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
- [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) _____
- [ ] After Allowance communication to Technology Center (TC)
- [ ] Appeal Communication to Board of Appeals and Interferences
- [✓] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [✓] Other Enclosure(s) (please Identify below):

RETURN POSTCARD

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual name	David C. Jenkins Eckert Seamans Cherin & Mellott, LLC
Signature	
Date	October 23, 2006

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below.

Typed or printed name	David C. Jenkins		
Signature		Date	October 23, 2006

PTO/SB/17 (12-04)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Effective on 12/08/2004.
Fees Pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL
For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 500.00

Complete if Known	
Application Number	10/692,116
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METHOD OF PAYMENT (check all that apply)

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☑ Deposit Account Deposit Account Number: 02-2556 Deposit Account Name: Eckert Seamans Cherin & Mellott

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the filing fee**

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
		Small Entity		Small Entity		Small Entity	
Application Type	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 or, for Reissues, each claim over 20 and more than in the original patent	50	25
Each independent claim over 3 or, for Reissues, each independent claim more than in the original patent	200	100
Multiple dependent claims	360	180

Total Claims	Extra Claims	Fee ($)	Fee Paid ($)
_____ - 20 or HP =	_____	x _____	= _____

HP = highest number of total claims paid for, if greater than 20

Indep. Claims	Extra Claims	Fee ($)	Fee Paid ($)
_____ - 3 or HP =	_____	x _____	= _____

HP = highest number of independent claims paid for, if greater than 3

Multiple Dependent Claims	
Fee ($)	Fee Paid ($)
_____	_____

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets	Extra Sheets	Number of each additional 50 or fraction thereof	Fee ($)	Fee Paid ($)
_____ - 100 =	_____ / 50 =	_____ (round up to a whole number)	x _____	= _____

4. OTHER FEE(S)

	Fees Paid ($)
Non-English Specification, $130 fee (no small entity discount)	
Other: Appeal Brief	500.00

SUBMITTED BY

Signature		Registration No. (Attorney/Agent) 42,691	Telephone 412/566-1253
Name (Print/Type)	David C. Jenkins		Date October 23, 2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Examiner: Stephen J. Castellano	
Group Art Unit: 3727	ALUMINUM CYLINDER WITH A PLASTIC COATING
In re Application of: RONALD CAUDILL ET AL.	
Serial No. 10/692,116	
Filed: October 23, 2003	Attorney Docket No. 282660-00247

APPELLANTS' BRIEF ON APPEAL

October 23, 2006

Commissioner for Patents
MAIL STOP APPEAL BRIEF - PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

This is an Appeal from the decision of the Examiner, dated August 17, 2006, rejecting Claims 1-16 of the above-identified application. The claims are set forth in Appendix 1, which is attached hereto. Due to the specific nature of the issues involved in this Appeal, an Oral Hearing is not deemed necessary and is not requested.

Real Party In Interest

The real party in interest is Harsco Technologies Corporation. An assignment from the inventors to Harsco Technologies Corporation was recorded on December 24, 2003 and is recorded at Reel/Frame 014831/0933.

Related Appeals and Interferences

There are no other appeals or interferences known to Appellants or to Appellants' legal representative which will directly affect, be directly affected by, or have a bearing on the Board's decision in the pending appeal.

Status of the Claims

Claims 1, 2, 6-9 and 14-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Haldenby* (U.S. Patent No. 5,474,846) in view of *Seal et al* (U.S. Patent No. 5,822,838).

Claims 3-5 and 10-13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Haldenby* ('846) in view of *Seal* ('838) as applied to claims 2 and 9 and further in view of *Luttmann et al.* (U.S. Patent No. 6,244,020).

Status of the Amendments

There are currently no amendments to the pending claims. The claims as they stand on Appeal are contained in the Appendix 1 to this Brief.

Summary of the Claimed Subject Matter

This invention relates to high pressure gas cylinders and, more specifically, to aluminum cylinders (14) having a plastic interior coating (24). Page 2, lines 25-27 It has been determined that when a composite/aluminum cylinder (14) is combined with a plastic coating (24), the total weight of the cylinder is reduced, compared with all metal cylinders, and the cycle life is significantly extended over that achievable by the base designs. Page 1, lines 26-31. More specifically, it has been found that use of the plastic coating (24) on a composite/aluminum cylinder (14) increases the cycle life of a cylinder between about 50% to 150%. *Id.*

The aluminum/composite/plastic cylinder (10) is a lightweight, thin-walled cylinder (14) containing an interior plastic coating (24) that is heat-bonded to the aluminum shell (22). Page 3, lines 6-8. The aluminum shell (22) is surrounded by a

composite outer wrap (20), typically carbon or aramid and fiberglass filaments held within an epoxy resin matrix. Page 3, lines 1-5. The cylinder (14) is designed to contain gas ranging in pressure from 500 to 10,000 psi. Page 2 lines, 5-6. The cylinders (14), typically, range in volume from 0.5 to 500 liters. *Id.* Such cylinders (14) are especially adapted to be used as a self-contained breathing apparatus, a home oxygen therapy cylinder, a commercial aviation cylinder, a fuel storage cylinder in natural gas and hydrogen vehicles, and with military and aerospace applications. Page 2, lines 6-9.

The Claims addressed on Appeal are identified below:

1. A gas cylinder (14) comprising:

an aluminum shell (22) having an outer side (26) and an inner side (28) defining a storage space (30);

a composite wrap (20) disposed about said aluminum shell (22); and

a plastic coating (24) disposed on said inner side (28).

2. The gas cylinder (14) of Claim 1, wherein said plastic coating (24) is heat bonded to said inner side (28).

3. The gas cylinder (14) of Claim 2, wherein said plastic coating (24) is a polyethylene copolymer.

4. The gas cylinder (14) of Claim 3, wherein said storage space (30) is between about 0.5 and 500 liters.

5. The gas cylinder (14) of Claim 4, wherein said composite wrap (20) is carbon or aramid and fiberglass.

6. The gas cylinder (14) of Claim 1, wherein said storage space (30) is between about 0.5 and 500 liters.

7. The gas cylinder (14) of Claim 1, wherein said composite wrap (20) is carbon or aramid and fiberglass.

8. A cylinder assembly (10) comprising:

a valve assembly (12) structured to sealingly engage a cylinder (14); and

a cylinder (14) comprising:

an aluminum shell (22) having an outer side (26) and an inner side (28) defining a storage space (30);

a composite wrap (20) disposed about said aluminum shell (22); and

a plastic coating (24) disposed on said inner side (28).

9. The cylinder assembly (10) of Claim 8, wherein said plastic coating (24) is heat bonded to said inner side (28).

10. The cylinder assembly (10) of Claim 9, wherein said plastic coating (24) is a polyethylene copolymer.

11. The cylinder assembly (10) of Claim 10, wherein said storage space (30) is between about 0.5 and 500 liters.

12. The cylinder assembly (10) of Claim 11, wherein said composite wrap (20) is carbon or aramid and fiberglass.

13. The cylinder assembly (10) of Claim 12, wherein said cylinder (14) is structured to contain a gas at a pressure between about 500 to 10,000 psi.

14. The cylinder assembly (10) of Claim 8, wherein said storage space (30) is between about 0.5 and 500 liters.

15. The cylinder assembly (10) of Claim 8, wherein said composite wrap (20) is carbon or aramid and fiberglass.

16. The cylinder assembly (10) of Claim 8, wherein said cylinder (14) is structured to contain a gas at a pressure between about 500 to 10,000 psi.

Grounds of Rejection to be Reviewed on Appeal

Claims 1, 2, 6-9 and 14-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Haldenby* (U.S. Patent No. 5,474,846) in view of *Seal et al* (U.S. Patent No. 5,822,838).

Claims 3-5 and 10-13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Haldenby* ('846) in view of *Seal* ('838) as applied to claims 2 and 9 and further in view of *Luttmann et al.* (U.S. Patent No. 6,244,020).

Argument

Claims 1, 2, 6-9 and 14-16; Rejected under 35 U.S.C. § 103(a).

Claims 1, 2, 6-9 and 14-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Haldenby* (U.S. Patent No. 5,474,846) in view of *Seal et al.* (U.S. Patent No. 5,822,838). *Haldenby* discloses the use of a plastic coating on the inner side of a steel cylinder. More specifically, *Haldenby* discloses a method of applying the plastic coating and identifies various types of plastics that may be utilized. As for the actual cylinder, *Haldenby* simply discloses the use of "standard steel" (Col. 2, line 38) and "stainless steel" (Col. 3, line 1). *Haldenby* does not mention the use of an aluminum cylinder.

Seal discloses a thin metal lined, composite overwrapped pressure vessel; that is, a metal cylinder with an outer composite layer. The metals identified as part of the *Seal* invention are titanium alloys, including the common Ti-6Al-4V alloy. In the prior history portion of the disclosure, *Seal* further mentions aluminum-lined composite wrapped tanks. Col. 1, lines 39-44. *Seal* further indicates that a protective coating may be applied to the composite wrap. Col. 9, line 14. *Seal* does not, however, disclose the use of a coating on the inner surface of the metal shell.

Accordingly, the Examiner has identified one reference that discloses the use of a plastic coating on the inner side of a steel shell (*Haldenby*) and another reference that discloses an aluminum shell having a composite wrap (*Seal*). The Examiner has further stated that, "[i]t would have been obvious to add the overwrap [of *Seal*] to reinforce the shell [of *Haldenby*] and make it capable of withstanding higher internal pressures," and, "[i]t would have been obvious to modify the metal of the shell to be aluminum to provide a metal of high strength to weight ratio to make the cylinder lighter for aerospace and rocket applications." The Examiner has not, however, indicated where the references teach or suggest such a combination and, as such, the Examiner has not presented a *prima facie* case of obviousness.

That is, as stated in, *In re Geiger*, 815 F.2d 686, 2 USPQ2d 1276 (Fed. Cir. 1987), "obviousness cannot be established by combining teachings of the prior art to produce the claimed invention, *absent some teaching, suggestion, or incentive supporting combination*" (emphasis added). Put another way, "the mere fact that disclosures or teachings of the prior art can be retrospectively combined for the purpose of evaluating obviousness/nonobviousness issue does not make the combination set forth in the invention obvious, *unless the art also suggested the desirability of the combination ....*" *Rite-Hite Corp. v Kelly Co.*, 629 F.Supp. 1042, 231 USPQ 161, *aff'd* 819 F.2d 1120, 2 USPQ2d 1915 (E.D. Wis. 1986) (emphasis added). Similarly, the court in, *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991), stated that "both the suggestion [to make the claimed apparatus] and the reasonable expectation of success must be found in the prior art, not in the

Applicants' disclosure." Here, there is no suggestion that the cited references should be combined. As such, the combination of these references would not be obvious to one skilled in the art.

Moreover, the standard used by the Examiner has been explicitly rejected by the courts and by the U.S. Patent and Trademark Office. For example, in *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984), the court addressed the Board's affirmation of a rejection under 35 U.S.C. § 103(a) wherein the Examiner had found a blood filter having a bottom outlet was obvious in view of a prior art blood filter having a lateral outlet. Noting that the prior art failed to suggest a modification of the location of the lateral outlet, the court overturned the Board stating that, "[t]he mere fact that the prior art could be so modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination."

While the *Gordon* case related to modifying a single reference, the holding was later expanded to include combinations of prior art in *Canady v. ERBE Elektromedizin GmbH*, 20 F.Supp.2d 54 (D.D.C. 1998). That is, the *Canady* court held that, "[t]he mere fact that references *can be combined* or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." *Id.* at 63 (emphasis added). This statement of the law is quoted in MPEP §2143.03 III which cites *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). In more recent years, this rule is typically restated as, "[i]t is axiomatic that a claimed invention is not obvious solely because it is composed of elements that are all individually found in the prior art." *Life Technologies v. Clontech Laboratories*, 224 F.3d 1320, 56 USPQ2d 1186 (Fed. Cir. 2000).

In the rejection set forth in the August 17, 2006 Office Action, the Examiner has merely identified the three elements of the present invention, *i.e.*, an outer wrap, an aluminum shell, and an inner plastic coating, in two different references. The Examiner has not identified where "the prior art also suggests the desirability of the combination" as required by both the law and the MPEP.

Independent Claim 1 recites a gas cylinder comprising an aluminum shell having an outer side and an inner side defining a storage space, a composite wrap disposed about the aluminum shell, and a plastic coating disposed on the inner side. As these references cannot be combined under 35 U.S.C. § 103(a) and as the individual references fail to disclose a gas cylinder comprising an aluminum shell having an outer side and an inner side defining a storage space, a composite wrap disposed about the aluminum shell, and a plastic coating disposed on the inner side, the rejection of Claim 1 under 35 U.S.C. § 103(a) is improper and the Examiner's rejection should be reversed.

Claims 2, 6 and 7 each depend from Claim 1 and rely on their dependency for patentability.

Independent Claim 8 recites a cylinder assembly comprising a valve, an aluminum shell having an outer side and an inner side defining a storage space, a composite wrap disposed about the aluminum shell, and a plastic coating disposed on the inner side. As these references cannot be combined under 35 U.S.C. § 103(a) and as the individual references fail to disclose a cylinder assembly comprising a valve, an aluminum shell having an outer side and an inner side defining a storage space, a composite wrap disposed about the aluminum shell, and a plastic coating disposed on the inner side, the rejection of Claim 8 under 35 U.S.C. § 103(a) is improper and the Examiner's rejection should be reversed.

Claims 9 and 14-16 each depend from Claim 8 and rely on their dependency for patentability.

Accordingly, the rejection of Claims 1, 2, 6-9 and 14-16 under 35 U.S.C. § 103(a) as being unpatentable over *Haldenby* in view of *Seal* is improper and the Examiner's rejection should be reversed.

Claims 3-5 and 10-13; Rejected under 35 U.S.C. § 103(a).

Claims 3-5 and 10-13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Haldenby* ('846) in view of *Seal* ('838) as applied to Claims 2 and

9 and further in view of *Luttmann et al.* (U.S. Patent No. 6,244,020). The deficiencies of *Haldenby* and *Seal* are discussed above. *Luttmann* discloses a process for producing a filled, sealed, and sterilized container that may be opened "without the aid of tools." Col. 1, lines 17-19. The container has a "weakening" at the "lid" wherein the container is structured to rupture upon the application of force. Such a container would, presumably, be used for food or medicines. Based on the foregoing, it is clear that the *Luttmann* container is not a high pressure device and, more importantly, *Luttmann* is non-analogous art.

As set forth in MPEP §2141.01, "[i]n order to rely on a reference as a basis for rejection of an applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." *Id.* citing *In re Oetiker*, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). That is, as set forth in MPEP §2141.01(a) IV, in *Oetiker*, the Appellant claimed an improvement in a hose clamp which differed from the prior art in the presence of a preassembly "hook" which maintained the preassembly condition of the clamp and disengaged automatically when the clamp was tightened. The Board relied upon a reference which disclosed a hook and eye fastener for use in garments, reasoning that all hooking problems are analogous. The court held the reference was not within the field of Appellant's endeavor, and was not reasonably pertinent to the particular problem with which the inventor was concerned because it had not been shown that a person of ordinary skill, seeking to solve a problem of fastening a hose clamp, would reasonably be expected or motivated to look to fasteners for garments.

Here, the invention is in the field of high pressure gas cylinders. That is, as set forth at page 2, line 5, the cylinder of the present invention is designed to contain gas at a pressure from 500 to 10,000 psi. To accommodate such pressures, fluids are transferred in and out via a valve assembly. Such containers do not have "weakenings" formed therein and do not use "lids" to seal the container. Thus, the cited art does not even rise to the level of similarity found insufficient in *Oetiker*. That is, in *Oetiker* the

invention was one type of hook and the cited art was another hook used in a different context. In this application, the invention relates to high pressure gas cylinders which are sealed with a valve assembly. Such high pressure gas cylinders are incompatible with a container that may be opened "without the aid of tools." As such, one skilled in the art of high pressure cylinders would not find the *Luttmann* reference to be relevant to problems associated with high pressure gas cylinders. Accordingly, *Luttmann* is non-analogous art.

Further, as set forth above, to support a combination of references under 35 U.S.C. § 103(a), the Examiner must indicate where in the cited references there is a teaching, suggestion, or incentive supporting the proposed combination. Again, the Examiner has merely stated that *Luttmann* could be combined with the other cited references, but has not shown that there is a teaching, suggestion, or incentive supporting the proposed combination.

Claim 3, which depends from Claim 2, recites a gas cylinder comprising an aluminum shell having an outer side and an inner side defining a storage space, a composite wrap disposed about the aluminum shell, and a plastic coating disposed on the inner side, wherein the coating is a heat bonded polyethylene copolymer. As these references cannot be combined under 35 U.S.C. § 103(a) and as the individual references fail to disclose a gas cylinder comprising an aluminum shell having an outer side and an inner side defining a storage space, a composite wrap disposed about the aluminum shell, and a plastic coating disposed on the inner side, wherein the coating is a heat bonded polyethylene copolymer, the rejection of Claim 3 under 35 U.S.C. § 103(a) is improper and the Examiner's rejection should be reversed.

Claims 4 and 5 depend, directly or indirectly, from Claim 3 and rely on their dependency for patentability.

Claim 10, which depends from Claim 9, recites a cylinder assembly comprising a valve assembly, an aluminum shell having an outer side and an inner side defining a storage space, a composite wrap disposed about the aluminum shell, and a plastic coating disposed on the inner side, wherein the coating is a heat bonded

polyethylene copolymer. As these references cannot be combined under 35 U.S.C. § 103(a) and as the individual references fail to disclose a gas cylinder comprising a valve assembly, an aluminum shell having an outer side and an inner side defining a storage space, a composite wrap disposed about the aluminum shell, and a plastic coating disposed on the inner side, wherein the coating is a heat bonded polyethylene copolymer, the rejection of Claim 10 under 35 U.S.C. § 103(a) is improper and the Examiner's rejection should be reversed.

Claims 11 and 12 depend, directly or indirectly, from Claim 10 and rely on their dependency for patentability.

Accordingly, the rejection of Claims 3-5 and 10-13 under 35 U.S.C. § 103(a) as being unpatentable over *Haldenby* in view of *Seal* and *Luttmann* is improper and the Examiner's rejection should be reversed.

Conclusion

It is submitted that Claims 1-16 are patentable over the prior art. Therefore, it is requested that the Board reverse the Examiner's rejections of Claims 1-16 and remand the application to the Examiner for the issuance of a Notice of Allowance.

Respectfully submitted,

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CLAIMS APPENDIX

1. A gas cylinder comprising:

an aluminum shell having an outer side and an inner side defining a storage space;

a composite wrap disposed about said aluminum shell; and

a plastic coating disposed on said inner side.

2. The gas cylinder of Claim 1, wherein said plastic coating is heat bonded to said inner side.

3. The gas cylinder of Claim 2, wherein said plastic coating is a polyethylene copolymer.

4. The gas cylinder of Claim 3, wherein said storage space is between about 0.5 and 500 liters.

5. The gas cylinder of Claim 4, wherein said composite wrap is carbon or aramid and fiberglass.

6. The gas cylinder of Claim 1, wherein said storage space is between about 0.5 and 500 liters.

7. The gas cylinder of Claim 1, wherein said composite wrap is carbon or aramid and fiberglass.

8. A cylinder assembly comprising:

a valve assembly structured to sealingly engage a cylinder; and

a cylinder comprising:

an aluminum shell having an outer side and an inner side defining a storage space;

a composite wrap disposed about said aluminum shell; and

a plastic coating disposed on said inner side.

9. The cylinder assembly of Claim 8, wherein said plastic coating is heat bonded to said inner side.

10. The cylinder assembly of Claim 9, wherein said plastic coating is a polyethylene copolymer.

11. The cylinder assembly of Claim 10, wherein said storage space is between about 0.5 and 500 liters.

12. The cylinder assembly of Claim 11, wherein said composite wrap is carbon or aramid and fiberglass.

13. The cylinder assembly of Claim 12, wherein said cylinder is structured to contain a gas at a pressure between about 500 to 10,000 psi.

14. The cylinder assembly of Claim 8, wherein said storage space is between about 0.5 and 500 liters.

15. The cylinder assembly of Claim 8, wherein said composite wrap is carbon or aramid and fiberglass.

16. The cylinder assembly of Claim 8, wherein said cylinder is structured to contain a gas at a pressure between about 500 to 10,000 psi.

EVIDENCE APPENDIX

None.

RELATED PROCEEDINGS APPENDIX

None.